Aalto University
School of Science

MS-E2177
Seminar on Case Studies in Operations Research

Final Report
Implications of Futures Markets to Pulp Industry: Business Game

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1 Introduction

Our client in this project is UPM, a Finnish forest industry company which consists of six business areas: UPM Biorefining, UPM Energy, UPM Raflatac, UMP Specialty Papers; UPM Communication Papers and UPM Plywood. This project is for UPM Pulp which is a part of UPM Biorefining business area. UPM Biorefining combines integrated production of sawn timber, pulp, renewable diesel and naphtha. UPM has four pulp mills in Finland and Uruguay and has over 150 customers in the pulp market.

1.1 Background

Pulp is a renewable and biodegradable wood-based raw material for papermaking and the industrial production of other paper products such as tissue, board and specialty paper [1]. UPM produces two types of pulp: softwood pulp and hardwood pulp. Softwood pulp is made from conifers such as pine and spruce. Softwood pulp has long fibres at a low density and it is often used in paper towels and other hygiene products. Hardwood pulp is made from leafy trees such as Nordic birch and eucalyptus. Their fibres are shorter which makes it softer than softwood. Hardwood pulp is often used for tissue papers. However, softwood and hardwood pulp are often mixed together depending on the end product. [2]

The pulp and paper production is capital intensive. Pulp mills are expensive and the largest variable cost is the direct raw material which is pulp and/or wood. Planned and unplanned breaks cause huge costs in lost revenue and also direct costs. In the papermaking, product price can be dependent on the pulp price itself.

The pulp market is a global commodity market and it is traded at a total value of 35-50 billion USD annually. There are three ways of trading pulp between seller and buyer: Annual agreements, a spot market, and since 2015 also with future markets [3]. Most pulp is dealt with long-term annual contracts between a pulp seller and a buyer. The prices are negotiated individually via e-mail or calls between supplier and consumer monthly or they are agreed beforehand on a fixed price. Ensured quality and reliability are reasons why buyers choose annual contracts. On the spot market, the pulp is traded on the best price basis. Sellers can offer their products and buyers can buy them for the market price. The competition creates an efficient market without regional price differences.

In recent years, futures exchanges have emerged as a new market channel for pulp. Futures are already used for similar commodities such as gold or oil. There are two types of future markets for pulp: financial futures and physical futures. Financial

futures, also called Swaps, can be traded OTC (Over the counter) or on the regulated commodity exchange NOREXECO since 2015. The exchange is licensed by the Norwegian Ministry of Finance [3]. In Norway financial futures, anonymous participants can trade fixed income with an agreed price for a floating price. Physical futures are dealt with in the Shanghai Futures exchange.

1.2 Objectives

In this report, we present the results of the created Pulp Business Game. This game mimics the activities in the pulp market with the different market channels of the annual contracts, the spot market, and implementation of futures exchange. The game offers an opportunity for the players to learn which strategies are effective for sellers (i.e. pulp producers) and buyers (i.e. paper manufacturers) to maximize their profits. The game also helps to teach how to act when unexpected changes in the production supply chain happens, such as production issues or supply chain incidents. The game is designed to help UPM Pulp management and salespersons of the implications of futures markets to the pulp industry.

2 Literature Review

The following literature overview presents the main concepts of this study. The literature review is divided into two main parts. At first, we present an overview of pulp markets and then gamification. Literature gave us very crucial knowledge to proceed with this project and details and functioning of the pulp markets. Based on the literature we were able to plan and execute this project.

2.1 Pulp Markets

Pulp is a very versatile product, which can be used for several purposes, such as biochemicals and cardboard. It is also recyclable material [2]. There are three ways how pulp is traded between buyers and sellers: annual agreements, a spot market, and since 2015 also with futures [3]. Pulp is an expensive commodity, which can influence the price of the end products to a great degree [4].

Annual contracts are reliable and easy for both the buyers and sellers. They obligate the buyer to purchase unit(s) of a particular monthly price, either negotiated between the parties or fixed to an index.

In recent years, spot market has grown and become an effective market channel for commodity products. Buyers can purchase or sell their commodities at any time. Through the spot markets buyers can modify their warehouse capacity when demand is observed. In general, spot markets are volatile and there is uncertainty in spot trading since trading must occur at a certain time to adjust warehouse capacity. Due to the market liquidity, there could also be some extra transaction costs for the traders. [11]

Financial future (swap) is a contract between two parties to exchange payments on future dates. Physical future is a contract between two parties where, commodity is agreed to buy on a future date at an agreed fixed price and the other side delivers the product at an agreed price. Both parties commit to the contract. Contracts are negotiated privately. [6]

2.2 Gamification

The different market mechanisms can be well illustrated in a business game. Business games use the concept of gamification, which can be described as the use of game elements in other contexts to engage and motivate people and promote learning to solve problems [7]. Business Games provide the opportunity to apply theoretical knowledge in a safe space and in a fun and entertaining way to try out and experience possible consequences of actions. Market simulations of future markets have shown that gamification and simulation are especially valuable if there is uncertainty in the game, the participants have gained better understanding of how to deal with price or order execution uncertainties. Competition and discussions further enforced the learning process. Reported limits of a Business game in that, it can only simulate reality to a limited degree and needs to simplify it's mechanics often, thus the players can get unrealistic effects for their input [8]. According to the 'Play Your Process' method, developed by Moreira de Classe et al.[9], the design process for a business game is divided into several phases. The method starts with a context analysis to understand the processes, followed by the process-game mapping to connect process and game elements which are documented in a game design document. Based on this, the game project can proceed and the designers can use their creativity to design an entertaining and enjoyable game. The game should be prototyped and afterward evaluated and tested before it can get published [9].

3 Methods

This chapter introduces our methods and approach to executing the pulp business game. At first, we present our approach for planning the game and used implementation. Then we describe the idea and the logic of the game and finally present a short instructions of the general game flow.

3.1 Approach

The work on the game was begun with a context analysis, where literature surrounding the topic was surveyed and the concepts central to the game were studied. This included researching concepts such as futures and swaps, which are relevant to understanding what the underlying concepts and mechanics of the simulated reality are, so that the reality could be gamified. Figure 1, presents the process for designing a business game. It is divided into several phases. The method starts with a context analysis to understand the creation process. Followed by the process-game mapping to connect process and game elements which are documented in a game design document. Based on this, the game project can be promoted. The designers can use their creativity to design an entertaining and enjoyable game. The game should be prototyped and afterward evaluated and tested before it can get published [9].
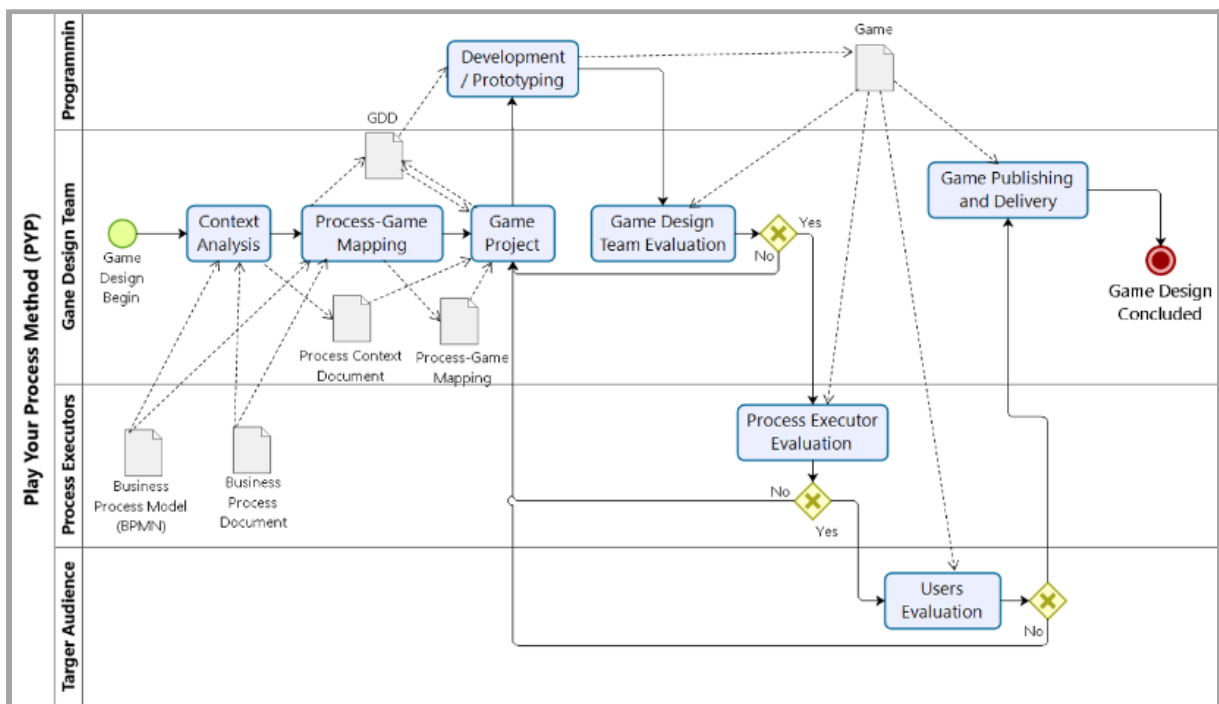

Figure 1. Process for designing a business game. The 'Play Your Process (PYP)' method, used to develop a gamification of the market. [9]

Next, an initial plan for the game was made, where the different types of players, their goals, the tools at their disposal, and the flow of the game were agreed upon initially. Also, different transactions throughout the game were decided such as possible unexpected events and trading. An initial implementation of the game was made and with feedback from the client refined into a complete product. Due to the remote working, the game ended up being implemented in Microsoft Teams platform. Figure 2 presents our plan for the flow of the game.
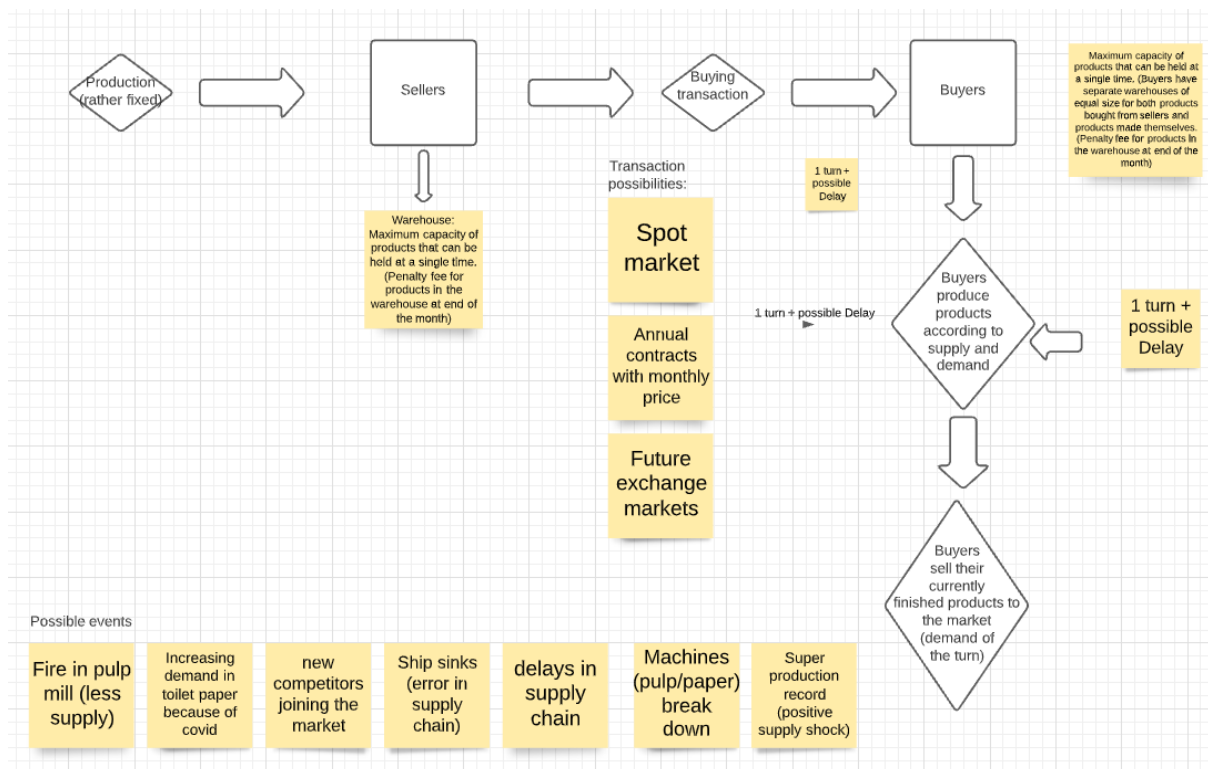

Figure 2. The initial plan for the flow of the game made by the team members through "Lucid Chart Program".

3.2 The flow of the game

The concept of the game involves two groups of players: sellers and buyers, who trade with each other. A winner will be chosen separately from the Sellers and buyers based on who in each group. The sellers have material produced to them by the sellers and have to gather and give that material forward based on a calculated turn-based demand that the buyers try to fulfill in each turn. The points that count towards winning the game are earned by the sellers and buyers by earning money compared to their original amount of capital. However, the goal of the players is to maximize your budget. At the end of the game the final budgets and the pulp that is at that moment in your warehouse will be valued and compared.

In the game, the sellers earn money by selling goods, which are generated to the sellers at a steady rate barring any events that modify the production. The buyers earn money by meeting goals for available supply per turn. Excess material in the warehouse costs a specific amount of money per unit every turn. Figure 3 shows the Teams view where the game master enters the values of each transaction per turn.

Figure 3. Image from the sheet of the Teams platform, where the game master enters the values of each transaction per turn.

Each round starts with the Gamemaster updating the values from last round, where players get to see the present effects of their transactions and any events that have occured. Then, they have three minutes (the total round is three minutes) to agree on transactions to make with one another in Teams groups established for each pairing of buyers and sellers. After the transaction has been mutually agreed upon the buyer pings the Gamemaster and informs them about the transaction so that the Game Master can record it to the sheet. Figure 4 shows how the game looks from the view of a buyer on their personal sheet.

A	Initial values	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9	Round 10
Production [t]	-	500	500	500	500	500	500	500	500	500	500
Traded quantity at spot market in this round [t]	-	100	400	0	0	0	0	0	0	0	0
Price of traded quantities at spot market [US$]	-	1000	210	0	0	0	0	0	0	0	0
Traded quantity of annual contracts [t]	-	0	300	310	310	310	310	10	0	0	0
Price of traded quantities of annual contracts [US$]	-	0	157,5	186000	186000	186000	186000	6000	0	0	0
Stock at end of round [t]	0	400	200	390	580	770	960	1450	1950	2450	2950
Free capacity in warehouse at end of round [t]	1000	600	800	610	420	230	40 ⊗	-450 ⊗	-950 ⊗	-1450 ⊗	-1950
Income in round [US $]	-	1000	367,5	186000	186000	186000	186000	6000	0	0	0
Expenses in round [US $]	-										
Budget at end of round [US $]	0	1000	1368	2E+05	4E+05	6E+05	7E+05	8E+05	8E+05	8E+05	8E+05

Overview of your annual contracts

This overview helps you to keep track of the annual contracts you have already made. Please document them here on your own, always after having m...
Consider your annual contracts when deciding on new transactions to make sure that you do not exceed your capacities and budgets.

Annual contract made in round ▼ Ends in round ▼ Quantity [t] ▼ Price [US$] ▼ With buyer no. ▼

Development pulp market price

⊗ If this symbol appears, the last transaction that you made was not valid. Inform the game master immediatly.
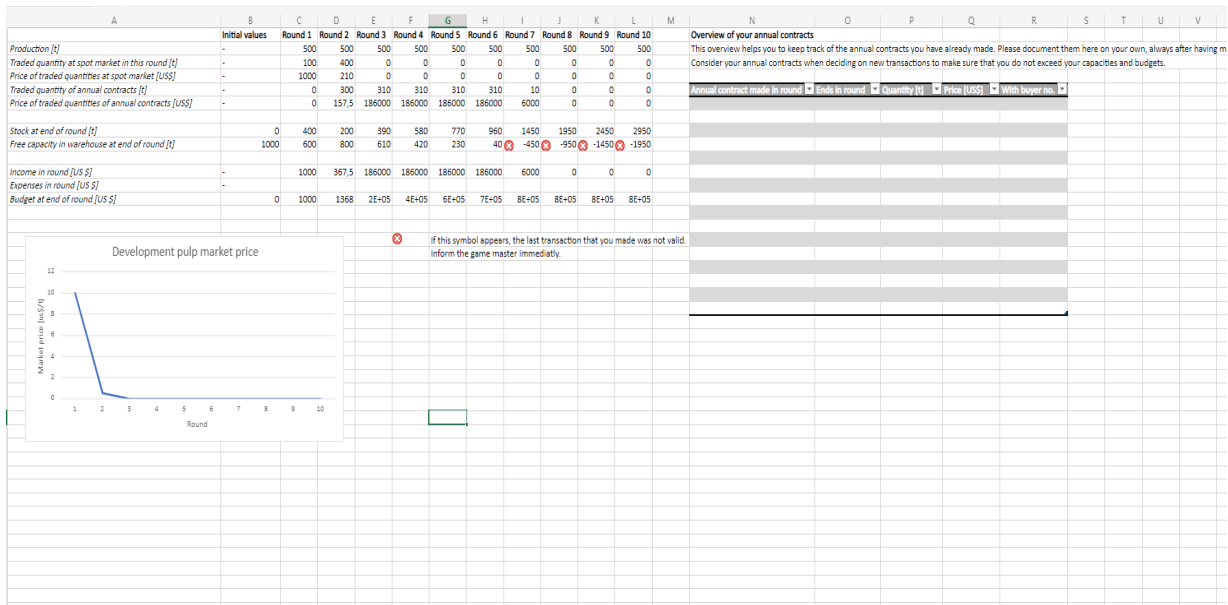
Figure 4. The progress of the game looks like from the point of view of a buyer on their personal sheet. The red x-markers means unrealistic transactions are about to be done.

The transactions modelled in the game are the spot market, annual contracts and private fixed price deals, which are similar to futures but are not anonymous. The spot market involves the seller selling an amount of goods at once with a single payment from the Buyer at the current market price. The annual contracts involve the sellers committing to sell a constant amount of pulp for five turns using the current market price. Private fixed price deals involve selling a constant amount of goods for a constant price at a set date. Private fixed price deals are very similar to futures, except they are not anonymous. When two sides engage in trading futures, the sides do not usually know who they are trading with. The futures were exchanged for private fixed price deals due to the technical limitations of the excel sheets format. Figure 5 shows the general view for the group.

There are different versions of the game. The Basic Game includes only transactions on the spot market. Modules 1 and 2 are extensions of the game. Module 1 includes transactions on the spot market as well as annual contracts. Module 2 combines the spot market and private fixed price deals. If all players are new to the game, it is good to start with the basic version.
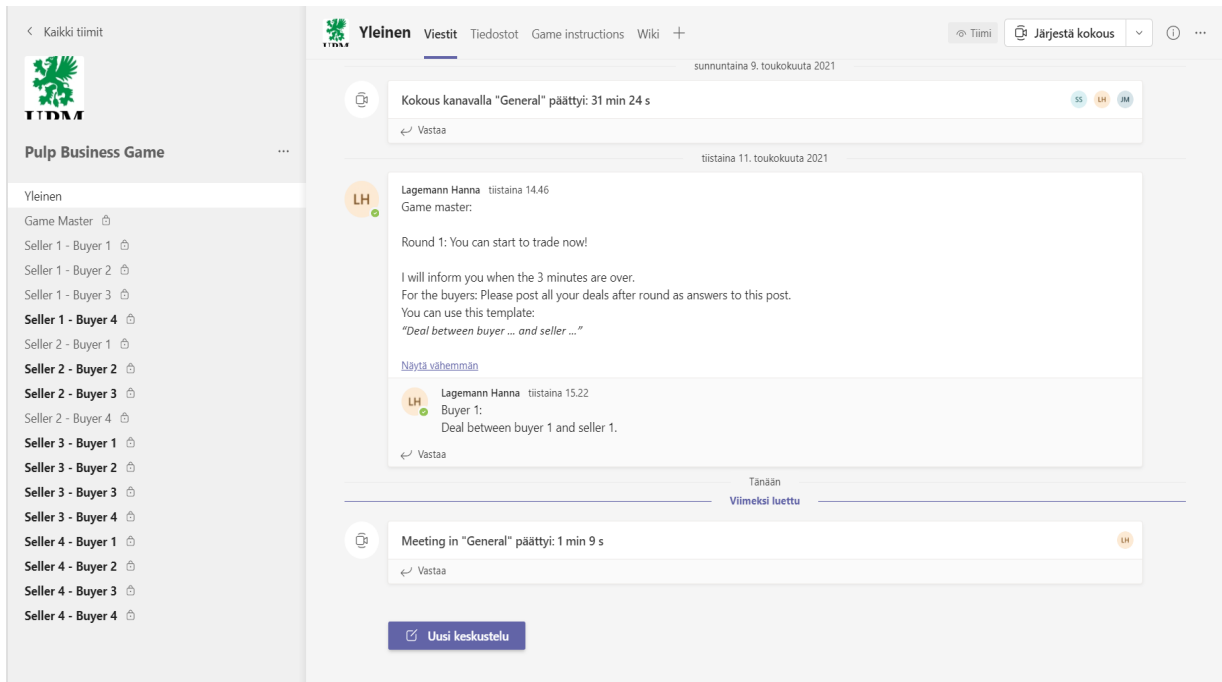
Figure 5. The General tab for the Group. On the left are the negotiation channels for the players to do transactions.

General instructions for playing the game

1. At the beginning of the game, decide who will be the game master, pulp sellers and buyers.
    a. The game master sets up the Microsoft Team environment and invites the people who will play the game.
        i.   Creates the private channels for the players (Teams provides the "general" channel).
        ii. The game master uploads the excel sheets (Basic game – Spot market', 'Module 1 – Annual contracts', 'Module 2 – Private fixed price deals', 'overview special events')
        iii. Paste instructions on tabs.
2. Start a call with all players
3. Open Basic game and general channel
4. Open your own worksheet where you can see your budget, production, warehouse capacity etc.
5. Each round lasts 3 minutes. And at that time you can trade with the other players through the private channels. You can make several transactions with different players in the same round.
6. The cycle of each round is roughly the following:
    a. Check for special events in the general channel. (ATTENTION: This is only from round 3 on)
    b. Check your worksheet and your current budgets and capacities.
    c. Trading starts when the game master says 'GO' (in the general call).
    d. The sellers post their offers into the channel with the buyers.
    e. The buyers check the offers that the sellers have made to them. As a buyer, you can accept the offer, reject it, or make a counteroffer.
        i.   The maximum number of counter offers that can be made by the buyer is two
        ii. The sellers need to continuously check all their private communication channels with the buyers to notice if a counteroffer was made.
    f. After 3 minutes, the game master will announce that the round is over.
        i.   All open offers expire
    g. The buyers inform the game master now about all deals they made
    h. The game master transfers the deals into the sheets.
7. After 10 rounds of the game the winners will be nominated based on the current budgets.
8. Further discussion and brainstorming based on the played game.

4 Results

We created a pulp business game with three modules. One with only the spot Market, one with private fixed price deals and another with annual contracts implemented. These are created in separate Teams sheets and are combined with a spot market used as an alternate method of exchange in the private fixed price deals and Annual Contracts implementations.

These different modules suit for new players making the learning curve of the game lower initially than if all the transactions were put into one module. However, the implementation of all transaction methods provides the simulation, where players can experiment with the methods of payment in the same game, thus comparing them with each other and being able to determine which methods are the most optimal in each phase/stage.

It was interesting to find out how far the commercial transactions could be isolated from the production, raw materials, supply and demand, which were abstracted away in the game and simplified to material coming into the Sellers' warehouses and a steady demand taking products away from the Buyers' warehouses. Without large parts of the supply chain and underlying economic realities being simulated properly, the goals, motivations, and course of action of the players seem to remain unchanged.

5 Discussion

5.1 Reflection on literature

Basic information on pulp and gamification was available readily. However, with new uses emerging for pulp and growing more relevant, there are new opportunities and unknowns which the literature is just catching up to.

Literature on gamification started to develop several decades ago, but it seems that much of the literature and interest on the topic has risen during the current millenium. There is a heightened interest in the topic and a belief in the future of gamification.

5.2 Assessment of the results

The result of the project is a simple model of business transactions between companies with many aspects of reality abstracted away or left out, yet it captures the essence of the decision making, when planning ahead purchases and sells of material to other companies. The core decision making process can be broken down to very basic ideas, which can be gamified to teach those aspects or to rehearse them so that one gets used to the mentality required by the game. If the mentality the game requires also applies also for the real world, the game has achieved its' most central goal despite any abstraction or simplifications made for the sake of gameplay or due to practical limitations of the project.

The resulting game not only provides insight into the phenomena it tries to simulate, but also works as a proof of concept for potential further gamifications of supply chain and business related events. There are also many directions where the game itself could be taken in the future, such as limiting the amount of production on the seller's end, while adding the amount of demand on the buyer's end. This would add more competition for the limited production of the sellers, presumably increasing sales prices and making private fixed price deals with high prices more common, as the sellers have more leverage over the buyers.

6 Conclusion

The project was about a very current topic. Gamification is a tool which has much potential in both motivating staff and teaching broad lessons in a way more structured teaching struggles to grasp. By learning through playing instead of studying causes and effects in a more traditional manner it is possible to see the forest from the trees while laying less emphasis on smaller details.

The gamification of pulp markets was facilitated by the fact that the markets have existed for a long time and thus many aspects of the pulp markets are known. However, there are also new aspects, such as it being possible to sell pulp via futures since 2015. Also, the fact that many aspects of the markets have existed for centuries does not mean there are no new ways to look at the markets to gain a better understanding of them and thus a competitive edge.

The project has both been a successful implementation of gamification for pulp markets and proved that gamification is a viable option as a tool for education and analysis. There are many aspects of markets, logistics and production into which the gamification could be easily expanded, given sufficient time and resources, such as creating a real futures market for the game, where the buyer and seller would be anonymous, or alternatively making the production of pulp on the seller's end and converting the pulp into an end product at the buyer's end cost money instead of the costs being abstracted away.

7 References

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8 Self Assessment

Scope

14

In the beginning of the project, scope seemed quite wide. However, when planning went further and after the research, it started to form practicable.

Risks

Unfortunately, some of our original estimated risks materialized during the project. Workload was not divided equally among the group which caused stress and bad feelings.

Schedule

The original planned schedule was followed until may. Finalizing the game prototype and writing the final report went very close to the final deadlines.

Project execution

Executing the project faced a few setbacks. However, we managed to finalize and complete the project. The usage of an Excel and Teams based execution for the project worked out well as it was relatively time efficient to work on and the Client was already familiar with the environment.

The amount of work

In the beginning of the project we managed to contribute the workload well. However, at the end of the course the amount of work was not successfully divided by the all team members. Overall, the amount of work in recent weeks was pretty heavy and last minute.

In what regard was the project successful?

The project was successful in learning widely from the pulp markets and business games in general.

In what regard was it less so?

The project was not that successful with meeting regularly and dividing the workload. The early fast progress of the project might have created a false sense of security, which

Team

There was a failure in the assessment and division of workloads halfway of the course and thus work on the project was divided unevenly. Since the problem was not addressed when it originally appeared or preempted it became progressively harder to fix in a satisfying manner as time went on. It would have also been wise to plan beforehand for unforeseen delays by aiming to finish work phases before they were supposed to be complete.

Teaching staff

It would have been possible to send corrections issued for the returnables back for acceptance sooner after each project meeting.

Client organization

There was an over month long break in communications around April due to there not being much new development to report at the time. In hindsight it was an error to not keep up communications weekly or biweekly to keep the Client updated on the status of the project. It would have been wise to approach the Client with questions more often when suffering a creative dead end or threatening to fall behind schedule.

Appendix

UPM Pulp Business Game
- Game Manual -
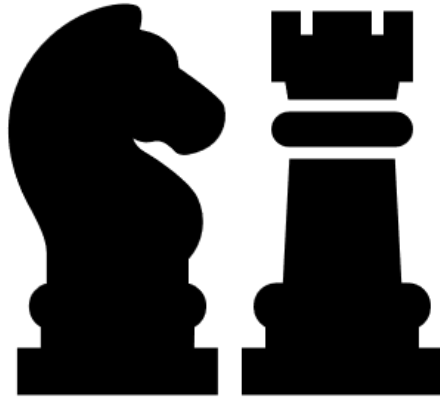
Result of project work for the course:
MS-E2177 - Seminar on Case Studies in Operations Research

Developed by:
Severi Saastamoinen, Marianne Jyrälä, Hanna Lagemann

May 19, 2021

General information

Recommended for 4-8 players plus a game master.

Estimated duration for one game: Approx. 1h

Requirements: All players need to have a Microsoft Teams account.

Additional to this game manual, you need the following excel sheets to play the game:
- 'Basic game – Spot market'
- 'Module 1 – Annual contracts'
- 'Module 2 – Private fixed price deals'
- 'Overview special events'

Before the game

Assign the roles

You should have a group of max. 9 people. Discuss first, who wants to be the **game master**. The game master does not play the game himself. He is the facilitator and observes and manages the game. Ideally, this should be done by someone who has already played the game before.

Once you have designated your game master, discuss who wants to be a **pulp seller** (produces the pulp in their own pulp mills and sells it then) and who wants to be a **pulp buyer** (buys pulp from the seller and processes it to the final products such as paper). If you are fewer players, try to assign the roles in a balanced way (e.g., not 2 sellers and 4 buyers, but 3 sellers and 3 buyers).

Document the roles here:

Overview roles

Role	Name
Game master	
Seller 1	
Seller 2	
Seller 3	
Seller 4	
Buyer 1	
Buyer 2	
Buyer 3	
Buyer 4	

Game setup

The game is designed to be playable remotely on the platform Microsoft Teams. Therefore, the first step is to set up a team as the environment for your game. This is a task of the game master.

Instructions to set up the environment in Microsoft Teams:
1. On the left side of Teams, click Teams, at the bottom of the teams list, click Join or create a team, and then click Create a new team. Name your team 'Pulp Business Game'.
2. Once you have created the team, invite the people who will play the game to join it.
3. Find the team that you created, click **More options ...** > **Add channel**.
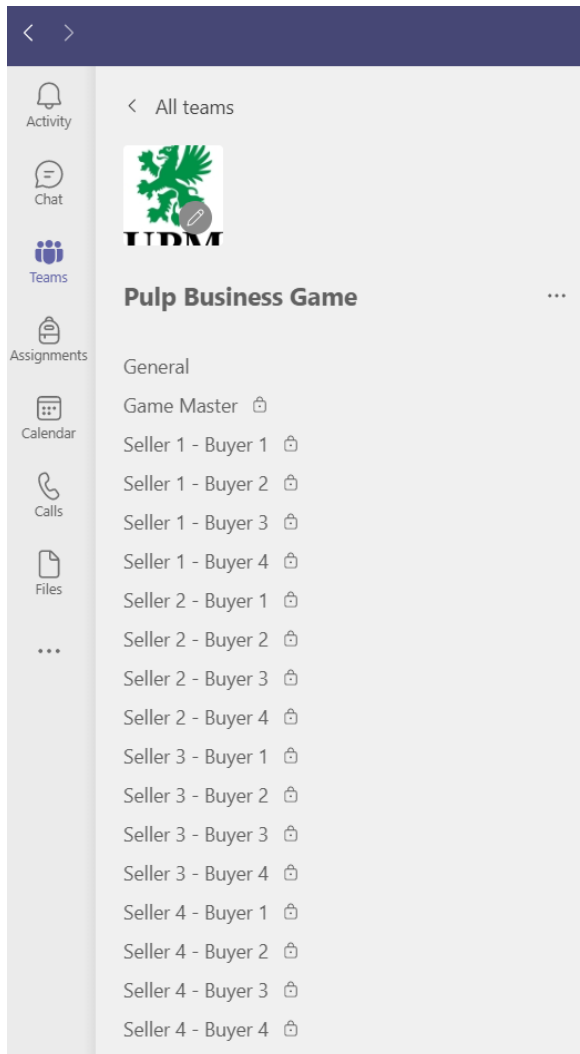
4.

5. Create the following channels. Make sure that you chose the 'private' option in the privacy settings (Drop-down list). Assign the respective players to the channels according to the channel names. Use the 'Overview roles' table to know who is which player. Now the players will just have access to the channels they are assigned to, whereas you as the game master can see all channels. Do not invite anyone else to the game master channel, it is only for you. You do not have to create a 'general' channel, Microsoft Teams provides this channel by default.

5. Upload the excel sheets 'Basic game – Spot market', 'Module 1 – Annual contracts', and 'Module 2 – Private fixed price deals' into the files section in the 'general' channel.

6. Upload the excel sheet 'Overview special events' into the files section in the 'game master' channel.

7. Take a screenshot of the filled 'Overview roles' table and post it into the 'general' channel.

8. Add a tab in the 'general' channel. Choose the Wiki type and name it 'Game instructions'. Copy and paste the section 'Instructions for players' into it.

9. Add a tab in the 'game master' channel. Choose the Wiki type and name it 'Instructions for the game master'. Copy and paste the section 'Instructions for the game master' into it.

10. Now you are done and ready to start the game!

Instructions for players

Start of the game
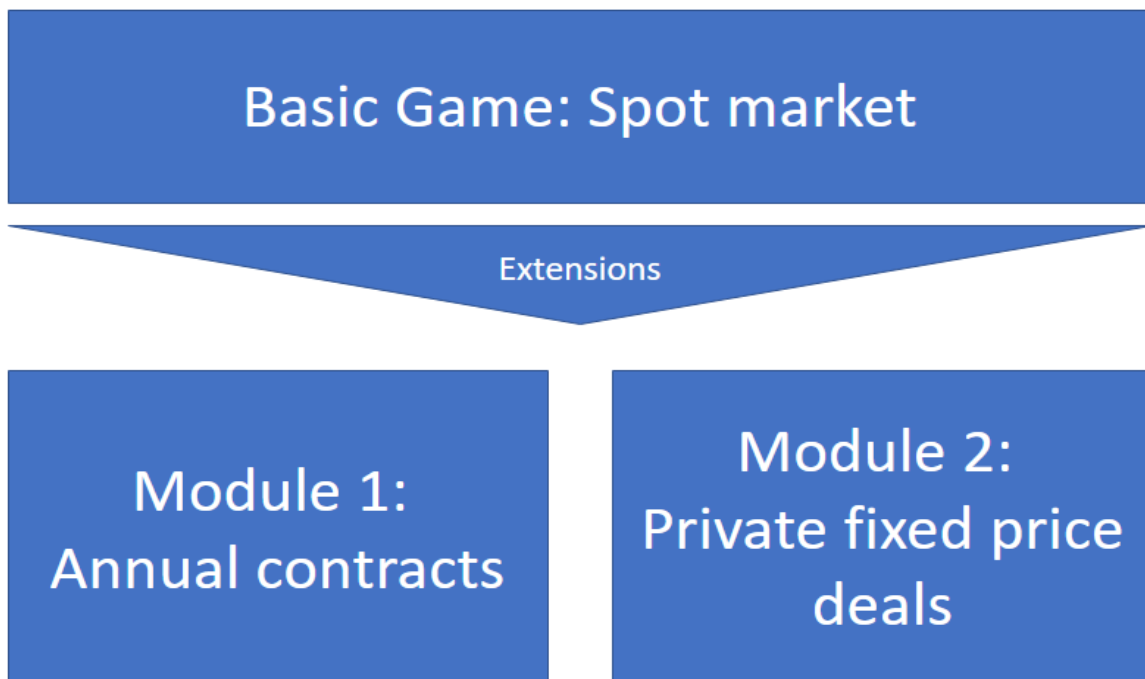
Basic Game: Spot market

Extensions

Module 1: Annual contracts

Module 2: Private fixed price deals

There are different versions of the game:

The Basic Game includes only transactions on the spot market. Module 1 and 2 are extensions of the game. Module 1 includes transactions on the spot market as well as annual contracts. Module 2 combines the spot market and private fixed price deals.

If all players are new to the game, start with the basic version. If the players have played the game before, you can also try Modules 1&2. Decide before the game which Module you want to play and read the respective instructions. The following instructions are for the Basic Game, the instructions for the modules are introduced later.

Prepare a pen and paper and optionally a calculator. You may find it helpful to take notes and use a calculator.

Every player opens the 'Pulp Business Game' team in Microsoft Teams. Join the general call with all players, the game master will also invite you.
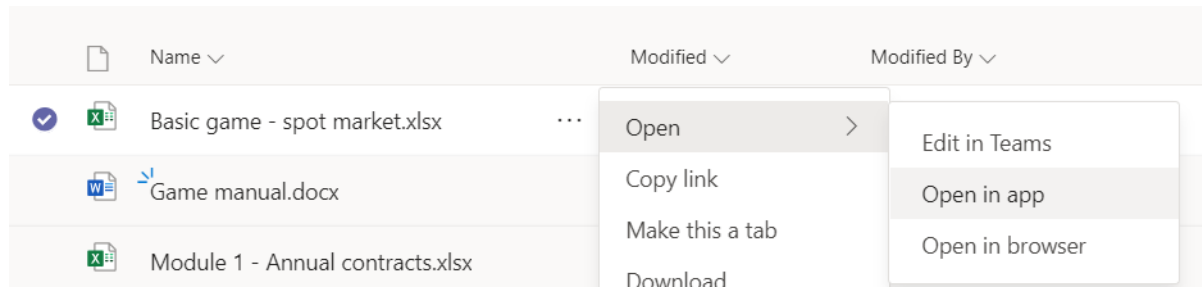
General understanding of the game

The 'Pulp Business game' aims to model the pulp market in an entertaining way. You will be the actors on the pulp market: The sellers, who produce the pulp in their own pulp mills and want to sell it and the buyers, who buy pulp from the sellers and process it to the final products such as paper and sell those on the end consumer market.

You have already chosen your roles. The **role overview** is visible in the 'general' channel. You also chose who will be your game master. The game master supports and guides you through the game.

You are already invited to the 'Pulp Business Game' Team in Microsoft Teams. The **'Posts' tab** in the 'general' channel will serve as the main communication channel for the game, together with the **call with all players**, which will persist during the whole game.

Please open the excel sheet 'Basic game – Spot market', which you can find in the 'files' tab in the 'general' channel. Open it **directly in the excel application**, not in teams. You can do this by clicking on the three dots à Open à Open in app. See here:

		Name ⌄		Modified ⌄	Modified By ⌄
✓	🗎	Basic game - spot market.xlsx	···	Open >	Edit in Teams
	🗎	Game manual.docx		Copy link	Open in app
	🗎	Module 1 - Annual contracts.xlsx		Make this a tab	Open in browser
				Download	

Keep this file open during the whole game. By opening it in the excel application, you can see the Teams channels and the sheets at the same time.

Click on **your worksheet** according to your role (e.g. Buyer 2). Do not open any other worksheet for confidential purposes. All you need during the game is your own worksheet.

This worksheet serves as your dashboard for the game and you have all the important variables that you need (Production/demand, Budgets, Warehouse capacity, etc.) in one place. The overview will help you to make decisions for trading pulp. You do not have to fill in anything in these worksheets, they will update automatically.

The game consists of **10 rounds**. During each round, you have the possibility to trade pulp with the other players.

Your goal is to maximize your budget. After round 10, the final budgets and the pulp that is at that moment in your warehouse will be valued and compared. There will be two winners, the seller and the buyer with the maximum budgets.

The **sellers** have a constant production in every round, which is the same for every seller. It is assumed that every seller has only one pulp mill. Every seller also has the opportunity to store the pulp in his warehouse. All warehouses have the same storage capacity. The stock at the end of the round indicates the amount of pulp that you have already stored in your warehouse. The traded quantity and the price of traded quantities document your transactions during this round. You can see your income and the overall budget at the end of the round. As a seller, you want to sell your produced pulp to generate a good income. What you produce but do not sell in the same round will be automatically stored in the warehouse. If you sell more than you have produced in that round, the pulp stored in your warehouse will be used for this. Make sure that you do not exceed your warehouse capacity and make feasible transactions.

The **buyers** have a constant demand for pulp. The demand models how much pulp they need to meet the demand of the end consumers for the final products, such as paper or tissues. The demand is the same for every buyer. As the sellers, the buyers also see their traded quantities of pulp, their prices, the stock, free warehouse capacity, and their budgets. The expenses of the buyers are their payments for pulp. The buyers generate income, through producing and then selling final products to the end consumers. The income is calculated through the quantity of pulp sold to the end consumers in the form of the final products times a fixed price per ton for sales to the end consumer market. You can see the fixed price at the bottom of the table. It is constant over time and the same for all buyers.

As a buyer, you want to fulfill the demand in order to generate a good income. The game is designed so that the buyers sell automatically as much as they can (from the received quantity in that round and the stock) to the end consumer market to fulfill the demand. Therefore, what they buy in a round is directly sold to the end consumer market and not stored in the warehouse, except for this case: If the received quantity in a round is higher than the demand, the demand will be fulfilled and the remaining quantity is stored in the warehouse. If a buyer receives less pulp in a round than the demand, he automatically uses as much of the stock as needed to fulfill the demand. The buyers do not have to worry about this mechanism, it will update automatically. However, it is important to understand the way it works in order to plan feasible transactions.

The players negotiate deals for a fixed amount of pulp for a fixed price in the spot market. Each round, you have 3 minutes to **trade with the other players** in the different private communication channels. Switch between the channels to make sure that you check the offers of all players. In the next chapter, there is a **step-by-step explanation** of what to do in a round. The players can see the **effects on their budget and capacities** after the round in their respective worksheets. It updated automatically. It is assumed that the traded quantities are in the warehouse within the same round when the trade is made, i.e., there are no delivery times. **Important for all players:** The values at the end of a round are always also the values for the beginning of the following round.

You can make several **transactions** with different players in the same round. However, please consider your current budgets and warehouse capacities before trading with other players. Do only transactions that are possible for you in that round. The **red cross symbol** will appear if a transaction exceeds your capacities and is not feasible. If the red cross appears, contact the game master.

All players can also see the **development of the pulp market price** from the former rounds in their sheet. The market price is the weighted average of all conducted transactions in the previous round. Use this as a help for setting prices for your future transactions.

From round three on, there might happen **special, unforeseen events**. It is max. one event per round, there may also be rounds when no event is happening. The events can have effects on the demand, the production, or the warehouses, which you should consider for your decisions in this round. They can affect only one or several players at the same time. The events happen in random order. The game master will inform you at the beginning of the round about the event and you will automatically see the effects for you in your worksheet.

Process of a round (Step-by-step checklist)

Instructions marked in green are only necessary to play modules 1 and 2. If the group just plays the basic game (Spot market version), ignore the green text. If you play the modules, read the green instructions additionally to the normal ones.

Step 1: Check for special events in the general channel. (From round 3 on)

Step 2: Check your worksheet and your current budgets and capacities. Take those into account when making deals to ensure that all deals are feasible.

Only for modules 1 and 2: Check your table on the right side of your worksheet (module 1: 'Overview of your annual contracts', module 2: 'Overview of your fixed price deals'). Take the deals you have already made into account when making future deals to not exceed your budgets or capacities.

Step 3: When the game master gives the go (In the general call), start to trade. The sellers post their offers into the channel with the buyers. As a seller, copy this, fill in your specific numbers and post it into the channel with the buyer with whom you want to trade:

- "Round 1: I offer ... tons of pulp for … US$ in total."

Module 1 and 2: Additional to the spot market offers you can now also negotiate annual contracts (module 1) or fixed price deals for a future round (module 2). The process is the same as for the spot market offers.

Module 1: If you as a seller want to negotiate an annual contract with someone, post this into the respective private channel (annual contracts last always for 5 rounds):

- *"Round 1, annual contract: I offer … tons of pulp per round for the next 5 rounds to the conditions of the respective market price."*

Module 2: If you want to negotiate a fixed price deal (module 2), use this as a seller and post it into the private channel with the player with whom you want to make the deal:

- *"Round 1, fixed price deal: I offer … tons of pulp for … US $ in total, paid and delivered in round … ."*

Indicate the amount of pulp you want to offer, for which price you want to sell it in total, and in which future round you want to sell it (it is not possible to have the same round as the date on which you are negotiating the deal).

Step 4: Now the buyers check the offers that the sellers made to them in the different channels. As a buyer, you can accept the offer, reject it or make a counteroffer. Therefore, copy one of the following options, fill in your numbers and paste it as an answer to the offer post of the seller in your private channel:

- "I want to make a counteroffer: … tons of pulp for … US$ in total." (You can adjust only the quantity, price, or also both)
- "Offer accepted"
- "Not interested in this round."

Module 1: Same procedure, as a buyer also post your answers to the respective post of the seller, only counteroffer is slightly different:

- *"I want to make a counteroffer: … tons of pulp per round for the next 5 rounds to the conditions of the respective market price."*

Module 2: Same procedure, as a buyer also post your answers to the respective post of the seller, only counteroffer is slightly different:

- *"I want to make a counteroffer: … tons of pulp for … US $ in total, paid and delivered in round … ."*

Step 5: The sellers have to continuously check all their private communication channels with the buyers to notice if a counteroffer was made. In case a counteroffer was made, you can also choose one of the following options, copy it, and paste it as an answer to the post:

- *"I want to make a counteroffer: … tons of pulp for … US$ in total." (You can adjust only the quantity, price, or also both)*
- *"Offer accepted"*
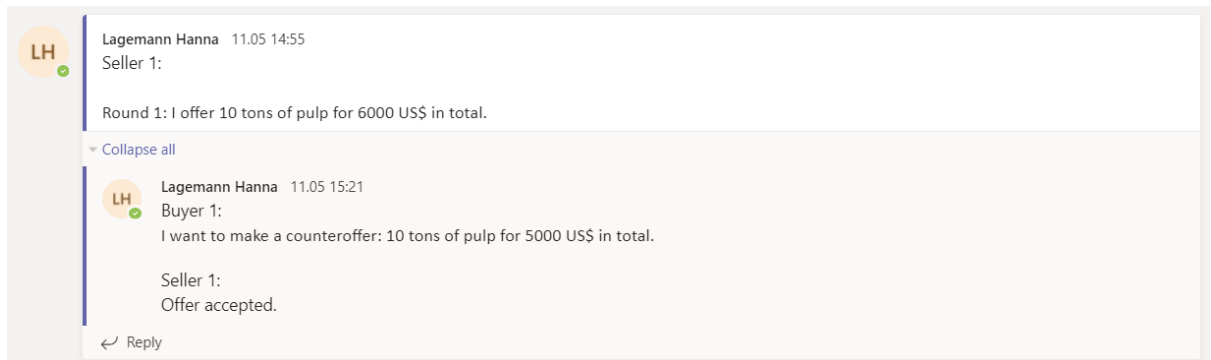
- ●
- ● *"Not interested in this round."*

Modules 1 and 2: Same procedure, use templates for counter offers of step 4.

Step 6: The maximum number of counter offers that can be made by the buyer is two. (Max.: Seller offer, counteroffer buyer, counteroffer seller, counteroffer buyer, counteroffer seller). After this, the buyer has to decide whether he wants to take the deal that was last proposed or wants to reject it.

- ● *"Offer accepted"*
- ● *"Not interested in this round."*

Step 7: After 3 minutes, the game master will announce that the round is over. If the time is up, all open offers expire, they cannot be negotiated again in the next round. Now, the buyers have to inform the game master now about all deals that they made. As a buyer, you check again all your private communication channels with the sellers and if you made a deal, copy, fill and paste this into the general channel as an answer to the respective round post of the game master. Copy this for each deal and insert your buyer number and the numbers of the sellers that you made the deal with.

- ● *"Deal between buyer … and seller …"*
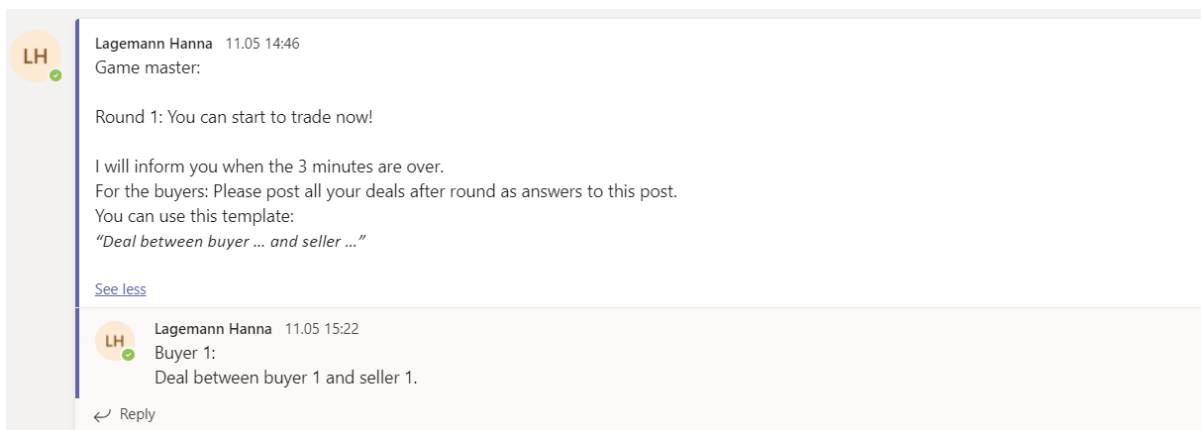
Module 1: Same procedure. If you as a buyer have made an annual contract, inform the game master about the contract by posting this as an answer to the post into the general channel:

- ● *"Annual contract between buyer … and seller … "*

Module 2: Same procedure. If you as a buyer have made a fixed price deal, inform the game master about the deal by posting this as an answer to the post into the general channel:

- ● *"Fixed price deal between buyer … and seller … "*

Step 8 *(only for modules 1 and 2): Document your annual contracts or fixed price deals made in this round on your own in the table at the right side of your worksheet in the excel*

sheet to have them in mind for your future decisions to not exceed your budgets or capacities.

Side note:

In general, you as a player do not have to fill in or change any cells in excel sheets except for the green tables in module 1 and 2! Do not change the value of other cells.

Always focus on the current round and the past rounds. Pretend as if you cannot see the future rounds and ignore the values, because they are not calculated yet. If you are getting confused with that, you can always change the color of the current round your are playing, for example change the color of that row to green. This way it might be easier for you to focus. However, make sure that you do not change any values and formulas of the cells!

End of the game

The buyer and the seller with the **maximum budgets and values in their warehouse** after round 10 win. The game master will inform you about the winners in the general channel and the call.

Module 1: Extension with annual contracts

To play module 1, all players have to **open the excel sheet 'Module 1 – Annual contracts'** instead of the 'Basic game – Spot market' sheet. The whole game takes place in the module 1 excel sheet, the spot market is also integrated there.

Sellers and Buyers can now also make annual contracts additionally to the spot market transactions. An **annual contract** is a contract between a seller and a buyer for a year with a fixed amount of pulp that is delivered monthly to the conditions of the current market price.

In this game, 5 rounds model one year, so **annual contracts last for 5 rounds** each. The annual contract and the first physical transaction start in the round when the contract is made.

Players can have several annual contracts with the same player at the same time.

The players **negotiate annual contracts in their private communication channels** the same way as they do transactions in the spot market. Check the optional steps of the negotiation process for the modules in the 'Process of a round (Step-by-step checklist)' chapter.

They negotiate a **fixed amount of pulp** that the seller ensures to provide to the buyer for the next 5 rounds. The **price is always the current market price** in that round, so the price is based on the transactions in the spot market. If there is no transaction in the spot market in a round, the market price cannot be calculated and a fixed price (can be set in worksheet 'Adjustable values') is used instead. The annual contracts do not affect the market price. The calculation of the market price is automated, and the players do not have to worry about that but it is good to understand in general how it works.

The **effects on budgets and capacities** of the annual contracts update automatically in the **players' worksheets**, but the players should keep track of their annual contracts in the list 'Overview of your annual contracts' in their worksheets on their own. This way, the players do not forget any contracts and have it in mind for their future decisions to not exceed their budgets or capacities.

Otherwise, the processes are the same as for the basic game.

Module 2: Extension with private fixed price deals

To play module 1, all players have to **open the excel sheet 'Module 2 – Private fixed price deals** instead of the 'Basic game – Spot market' sheet. The whole game takes place in the module 2 excel sheet, the spot market is also integrated there.

In module 2, players can also suggest **private fixed price deals**. A fixed price deal is a deal between a seller and a buyer about a **fixed amount** of pulp for a **fixed price**, which will be executed on a **fixed date** (in this game in a fixed round) in the future. The fixed price deals are similar to futures, but they are not anonymous. With futures, both sides of the contract usually do not know each other. In the game, the deals are **negotiated in the private channels** the same way as the spot market transactions and therefore the players know their contract partner.

For the game, it is assumed that the physical transaction of the pulp and also the payment transfers happen at the same time, in the future round which was indicated in the contract. This means that players can already negotiate a contract, but they will see the effects on their budgets and capacities in their worksheets only in the future round.

Since a fixed price deal is for a future date, the execution in the first round is not possible. This would be a spot market transaction. But it is possible to negotiate fixed price deals for future rounds from the first round on.

The worksheets of the players update again automatically. However, the players should keep track of their fixed price deals in the list **'Overview of your fixed price deals'** in their worksheets on their own. This way, the players do not forget any deals that will happen in the future and have it in mind for their decisions to make feasible transactions.

The market price also includes the prices of the fixed price deals in this module automatically.

A player can negotiate several fixed price deals in the same round and also have several deals being executed in the same future round. But players can only make one contract with the same payer for the same future date. Otherwise, the processes are the same as for the basic game.

Instructions for the game master

Start of the game

Familiarize yourself with your tasks in guiding the players. Read the instructions for the players provided above to understand the whole game.

We recommend asking the players as well to familiarize themselves already before the game with the instructions to save time.

You will need a timer (watch, phone…). You may want to take notes.

Open the file **'Overview special events'** in your private game master channel in the files tab. Always open files in the excel application (Instructions see 'General understanding of the game'). If needed, **change the adjustable values** (marked in green). Read the explanations provided there. **Click only ones** at the beginning of the game in a cell in the column 'Event' (B) and press Enter. The cells will update randomly and give a new order for the events that are happening and also automatically assign players randomly to the events.

Open the excel sheet 'Basic game – Spot market' in the files tab in the general channel. Also, open it in the excel application.

Optionally: Adjust some values before the game in the worksheet 'Adjustable values'.

Every player opens the 'Pulp Business Game' team in Microsoft Teams. **Start a call** with all players and read out loud the 'Instructions for players' or only discuss questions if the players have read this already before. Tell players: You can also find the instructions at any time in the 'Game instructions' tab in the general channel.

During the game: Checklist of tasks

Follow this process for each round:

	A	B	C
1	Round	Event	For which player?
2	1	-	-
3	2	-	-
4	3	6	Seller No. 3
5	4	5	Seller No. 1
6	5	4	Seller No. 3

1.

2. From round 3 on: Check the special events in the excel sheet 'Overview special events' in the file section of your game master channel.

Open the worksheet 'Special events' in the sheet 'Basic game – Spot market'. Insert a 1 in the cell for the event and the specific player (here event 6 happens to seller 3) in the matrix of the current round.

	A	B	C	D	E	F	G	H	I
1	**Round 3**								
2		Special Events							
3		No.1	No.2	No.3	No.4	No.5	No.6	No. 7	No. 8
4	Seller 1				0	0	0	0	0
5	Seller 2				0	0	0	0	0
6	Seller 3				0	0	1	0	0
7	Seller 4				0	0	0	0	0
8	Buyer 1							0	0
9	Buyer 2	0	0	0				0	0
10	Buyer 3							0	0
11	Buyer 4							0	0

The effects of the event will update automatically, but you have to inform the players about it.

Look up the event with the respective number (here 6) in the table on the right in the sheet 'Overview special events':

5	Super production record	Production	"Seller [#], you hired some new young employees, who are highly motivated and completely overperformed during their first weeks in this round. They set a new production record in your pulp mill and produced significantly more pulp than usually."	1 Seller
6	Machine breaks down	Production	"Seller [#], one of the most important machines in your pulp mill broke down. It will take the whole round to fix it again. Therefore, you will produce less than usually. "	1 Seller
7	Warehouse burns down	Stock	"Sorry seller/buyer [#], one of your employees was illegally smoking in your warehouse and caused a huge fire. Your whole warehouse burned down and you lost all your stored resources. "	1 Seller or Buyer

Copy the text of the event and insert it in the next step.

2. Post this into the general channel:

For round 1 and 2:

> *"Round 1: You can start to trade now! I will inform you when the 3 minutes are over. For the buyers: Please post all your deals after the round as answers to this post. You can use this template: 'Deal between buyer … and seller …' "*

From round 3 on (with special events):

> *"Round 3:*
> *Special event: [paste here the text of the event that you have copied from the table in step 1]*
>
> *You can start to trade now! I will inform you when the 3 minutes are over. For the buyers: Please post all your deals after the round as answers to this post. You can use this template: 'Deal between buyer … and seller …' "*

3. Inform the players also verbally in the main call now, that the negotiation round starts. In the first round, tell the players that reasonable numbers for the pulp price are approximately between 440 US$ per ton and 1200 US$ per ton. They should try to stick to this range for their transactions. (The quantity they can trade is limited by their production capacities. For the sake of simplification, these are not based on real numbers.)

4. Set a timer for 3 minutes to stop the time for the trading process. Three minutes per round is a recommendation, if you feel like this is too long or too short during the game, you can adjust spontaneously.

5. Inform the players verbally in the main call after 3 minutes. Remind them that the buyers should now inform you about their deals by posting an answer to your post of this round in the general channel.

6. Once all the buyers have posted their deals, check for each deal the respective private channel between the two players involved to see the details of the deal. A deal is only made if the buyer has confirmed it with 'Offer accepted' as the last answer and the maximum number of counter offers that can be made by the buyer is two. If these rules are not applied, the deals are not valid and you can ignore them.

	A	B	C	D	E
1	**Round 1**	Insert **quantity** of offer in [tonnes]			
2		Buyer 1	Buyer 2	Buyer 3	Buyer 4
3	Seller 1	0	0	0	0
4	Seller 2	0	0	0	0
5	Seller 3	0	0	0	0
6	Seller 4	0	0	0	0
7	Sum Tonnes	0			
8					
9		Insert **price** of offer [US $]			
10		Buyer 1	Buyer 2	Buyer 3	Buyer 4
11	Seller 1	0	0	0	0
12	Seller 2	0	0	0	0
13	Seller 3	0	0	0	0
14	Seller 4	0	0	0	0
15	Sum Price	0			

7.

8. For the valid deals: Transfer the details of the deals into the 'Transactions spot market' worksheet in the sheet 'Basic game – spot market'. Insert the quantity and the price in the respective matrices for the two players who made the deal. The sums are calculated automatically. The players will see the effects in their worksheets automatically. Do this for all deals that you have been informed about below your post in the general channel.

8. If a player informs you that they see the red cross symbol in their worksheet, check first if it is for the current round. If it is for a future round, it can be ignored. If it is for the current round, the last transaction was not feasible. Give those two players an additional minute to renegotiate their deal in their private channel to make it feasible. If the minute is up and they did not agree on a feasible transaction, just annulate the deal.

9. Start again from step 1 on for the next round!

Side notes:

For now, all players can see which player made which type of deal with which another player by posting it into the general channel, but not the details of the deal. If you want to have this **more confidential** or if the players ask for that, use your private chat: The buyers should just send you a private message after the negotiation round to inform you about their deals instead of posting it visible in the channel. However, this conversation is in your business-as-usual conversations in Microsoft Teams then and might be confusing.

In general, there is a **color code**: Grey cells do not have to be changed, do not insert something in grey cells! Cells marked in green are adjustable cells, you can change the values. In the transaction sheets, the matrices are white. You can insert a 1 in the white cell where appropriate to model the transaction.

Module 1: Extension with annual contracts

To play module 1, all players have to **open the excel sheet 'Module 1 – Annual contracts'** instead of the 'Basic game – Spot market' sheet. Open as always in the excel application. The whole game takes place in the module 1 excel sheet, the spot market is also integrated there.

The players can now negotiate annual contracts as well as spot market deals.

You follow your process as usual. In **step 7**, you now also check the annual contracts in the private channels that the buyers have informed you about. **Transfer the detail of the contracts into the worksheet 'Annual contracts'.** You only have to insert the negotiated quantity in the specific cell in that round when the contract is made. You do not have to insert the quantity in the following rounds again, it will calculate that as well as the prices automatically. Transfer the spot market deals as usual.

Remind the players after each round that they should document their annual contracts on their own in the table 'Overview of your annual contracts' in their worksheets.

Module 2: Extension with private fixed price deals

To play module 2, all players have to **open the excel sheet 'Module 2 – Private fixed price deals'** instead of the 'Basic game – Spot market' sheet. Open as always in the excel application. The whole game takes place in the module 2 excel sheet, the spot market is also integrated there.

The players can now negotiate private fixed price deals as well as spot market deals.

You follow your process as usual. In **step 7**, you now also check the affixed price deals in the private channels that the buyers have informed you about. **Transfer the details of the deals into the worksheet 'Transactions fixed price deals'.** Insert the quantity and the price of the deal in the round when the physical transaction and the payment will take place (the round the players have agreed on), not in the current round when the deal was negotiated. The effects for the players will then automatically be calculated in the round when the transaction takes place. Transfer the spot market deals as usual.

Remind the players after each round that they should document their fixed price deals on their own in the table 'Overview of your fixed price deals' in their worksheets.

End of the game

The buyer and the seller with the **highest budgets, in the end, are the winners**. Therefore, the final budgets and the pulp that is at that moment in the warehouse will be valued and compared. For the buyers, the pulp in the warehouse is valued with the fixed end consumer market price and for the sellers with the market price of the last round.

After the end of round 10, it is your task to **check the winners in the worksheet 'Calculation of winners'** in the excel 'Basic game – spot market' (winners marked in green). Announce the winners in the main call and also with a post in the general channel:

- "Congratulations, seller … and buyer …, you won this game! You managed your transactions best."

Recap – Lessons learned

Optionally: We recommend starting a 10-15 minute long **discussion** in the main call with all players as a follow-up of the game. Every player should have the opportunity to express his or her experiences with the game and especially **draw conclusions about the learnings** that they had during the game.

In order to facilitate the discussion, questions could be:

- What surprised you during the game?
- What was difficult, what was easy?
- Did you have specific strategies?
- What worked out well, what did not work out well?
- What are your key learnings of the game?

- How are the learnings from the game transferable and applicable to the real pulp market?
- What insights did you get about the pulp market?

Reset the game

After having played the game, you should reset everything as preparation for the next game if you want to use the same Microsoft Team again.

Delete all values in the transaction worksheets ('Transaction spot market', 'annual contracts', 'transactions fixed price deals'), i.e., set them to zero again. Same for the special event matrices. Everything else will then reset automatically.

To not confuse the next players, delete all conversations and posts in the general channel as well as in the private channels of the players. Now you can replay the game in the same Microsoft Team the next time!